FIG. 1

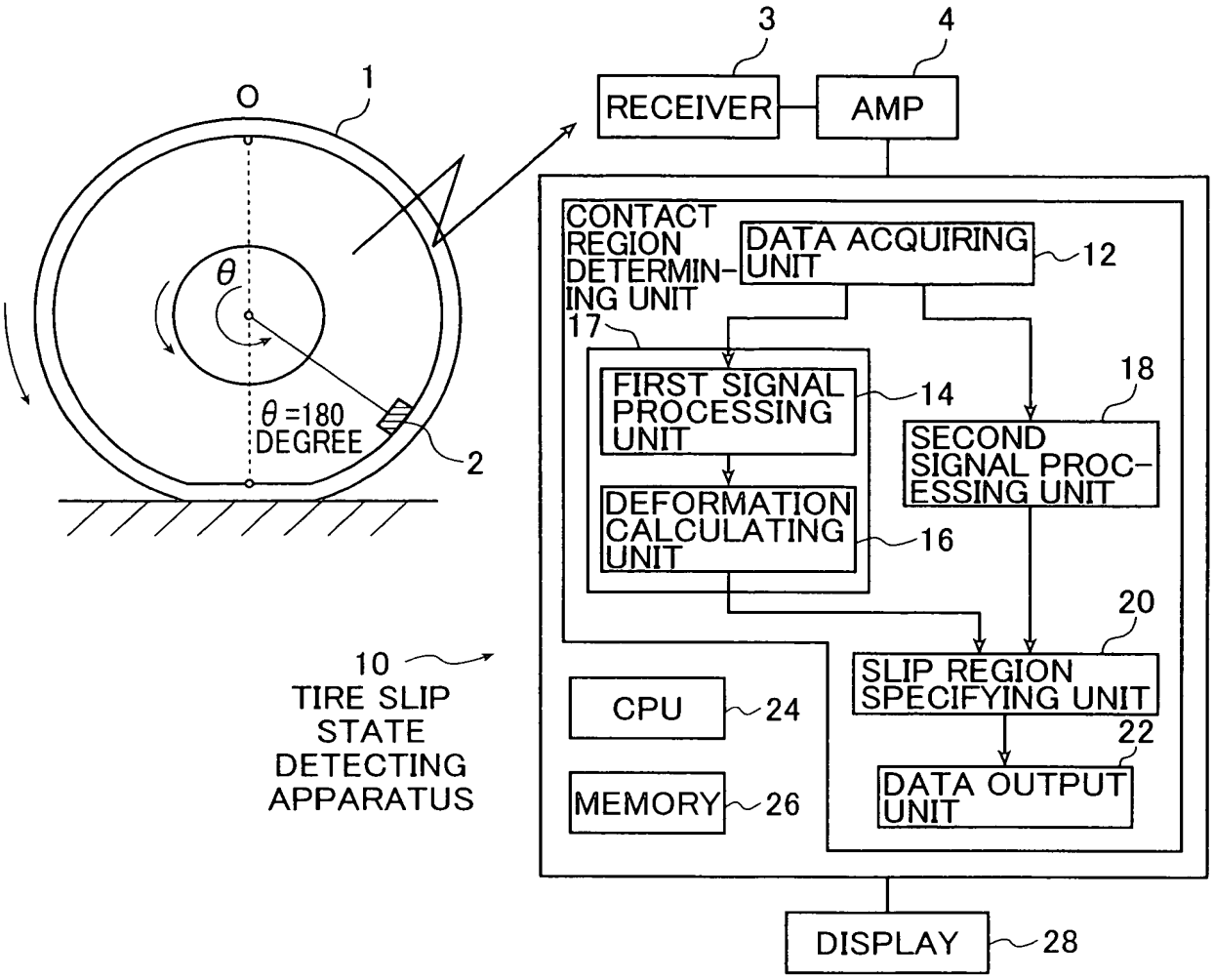
O
1
θ
θ =180 DEGREE
2
3
4
RECEIVER
AMP
CONTACT REGION DETERMIN-ING UNIT
17
DATA ACQUIRING UNIT
12
FIRST SIGNAL PROCESSING UNIT
14
18
SECOND SIGNAL PROC-ESSING UNIT
DEFORMATION CALCULATING UNIT
16
20
SLIP REGION SPECIFYING UNIT
22
DATA OUTPUT UNIT
CPU
24
MEMORY
26
10
TIRE SLIP STATE DETECTING APPARATUS
DISPLAY
28

FIG. 2

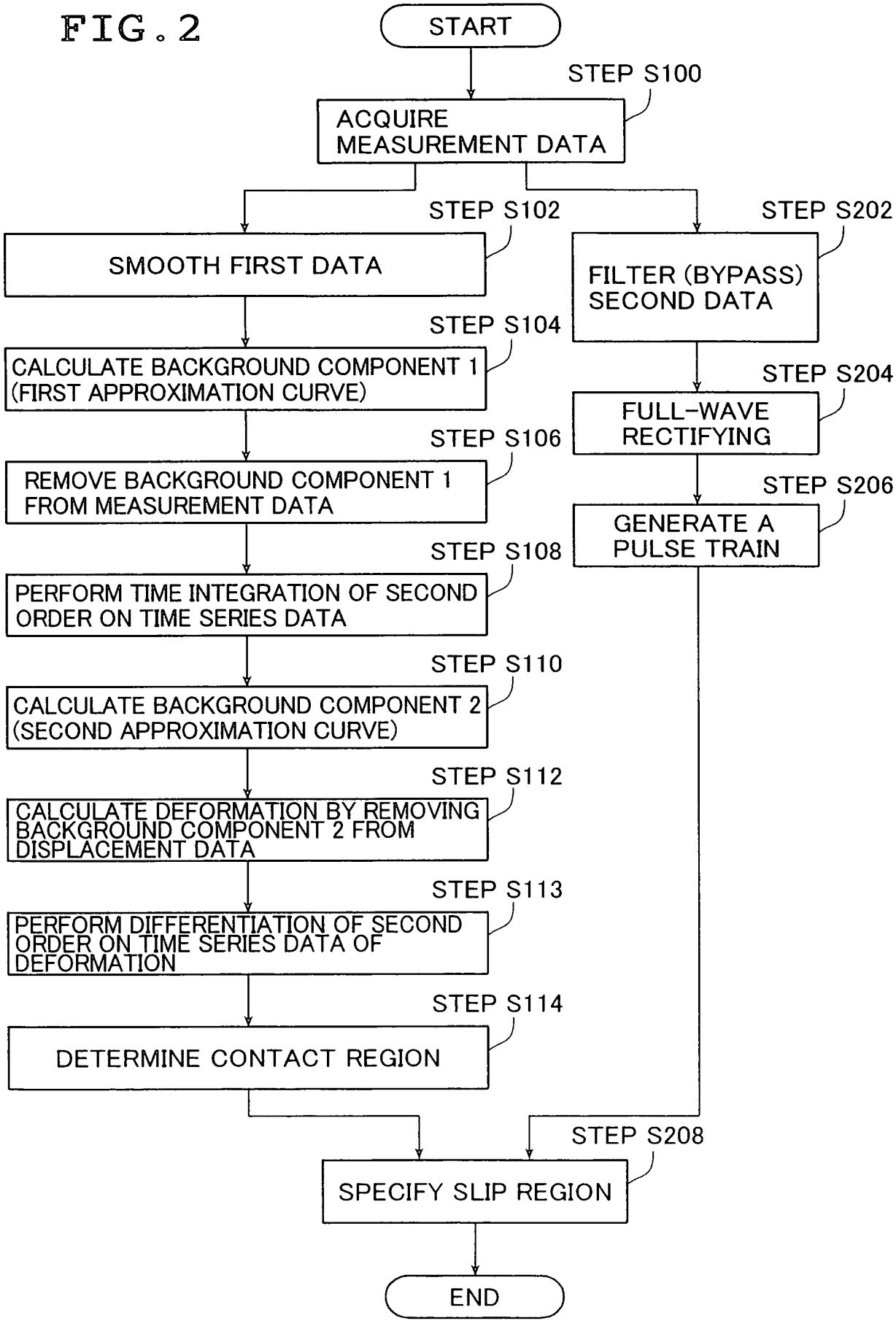
START
STEP S100
ACQUIRE MEASUREMENT DATA
STEP S102
SMOOTH FIRST DATA
STEP S104
CALCULATE BACKGROUND COMPONENT 1 (FIRST APPROXIMATION CURVE)
STEP S106
REMOVE BACKGROUND COMPONENT 1 FROM MEASUREMENT DATA
STEP S108
PERFORM TIME INTEGRATION OF SECOND ORDER ON TIME SERIES DATA
STEP S110
CALCULATE BACKGROUND COMPONENT 2 (SECOND APPROXIMATION CURVE)
STEP S112
CALCULATE DEFORMATION BY REMOVING BACKGROUND COMPONENT 2 FROM DISPLACEMENT DATA
STEP S113
PERFORM DIFFERENTIATION OF SECOND ORDER ON TIME SERIES DATA OF DEFORMATION
STEP S114
DETERMINE CONTACT REGION
STEP S202
FILTER (BYPASS) SECOND DATA
STEP S204
FULL-WAVE RECTIFYING
STEP S206
GENERATE A PULSE TRAIN
STEP S208
SPECIFY SLIP REGION
END

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FIG. 3A

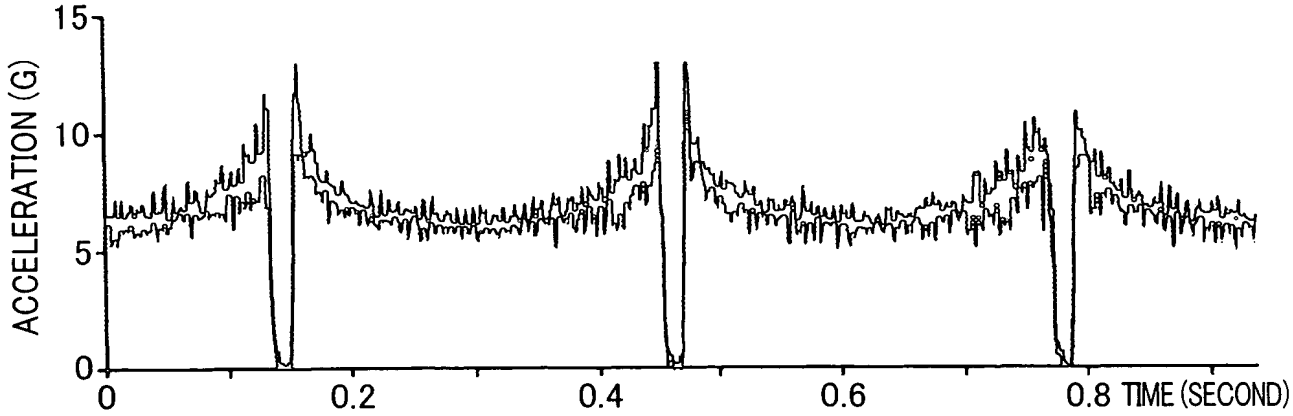

FIG. 3B

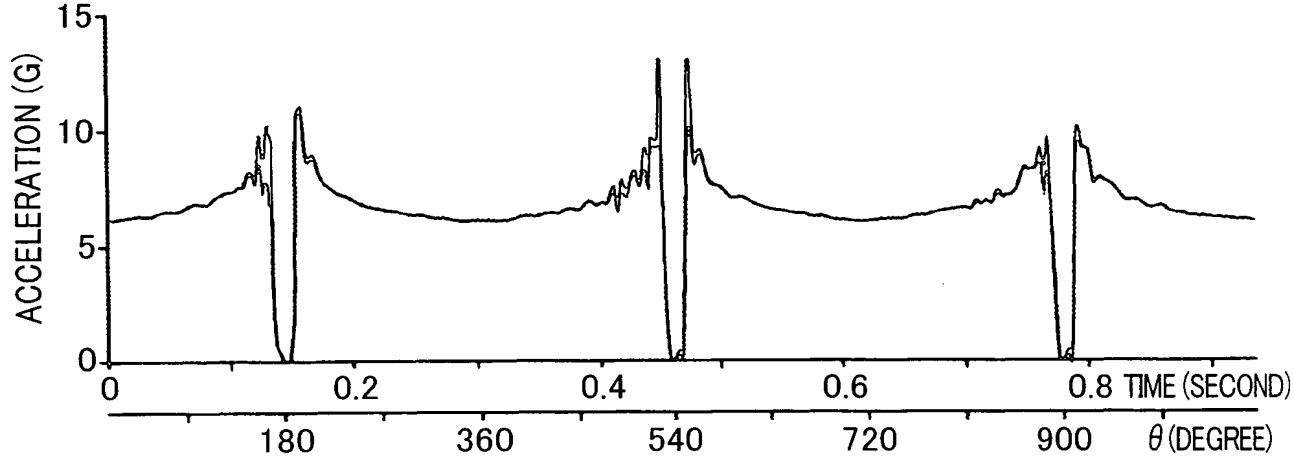

FIG. 3C

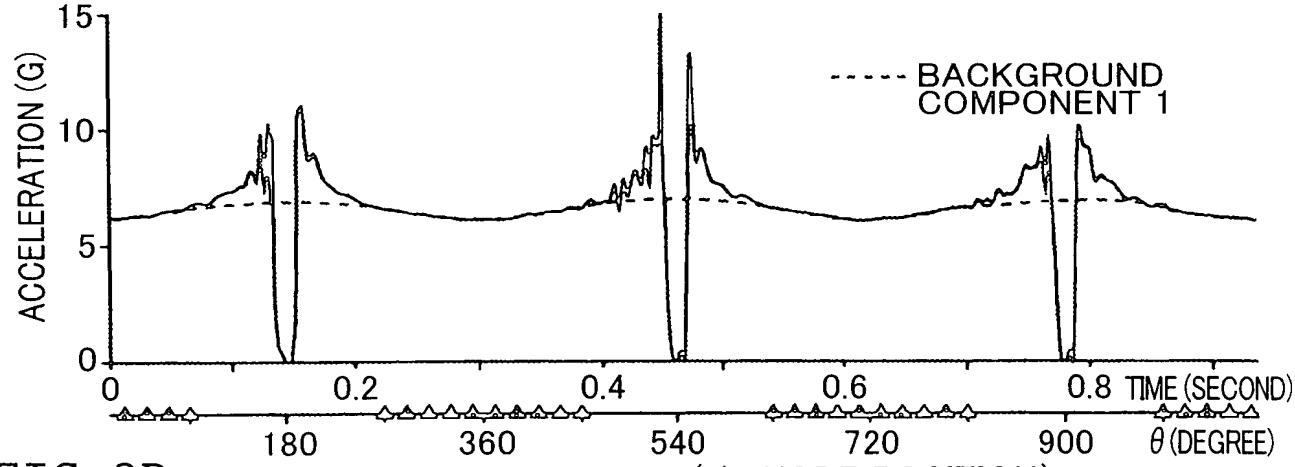

FIG. 3D

(△: NODE POSITION)

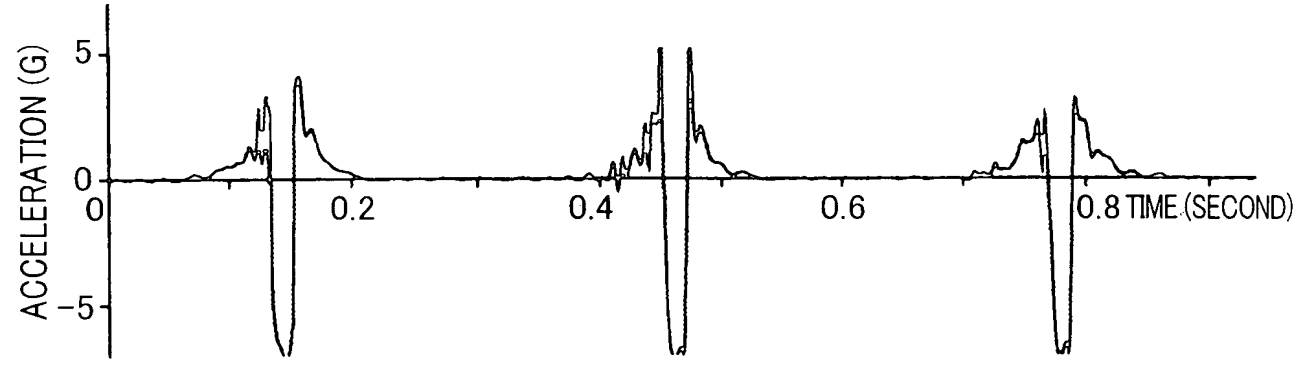

FIG. 4A

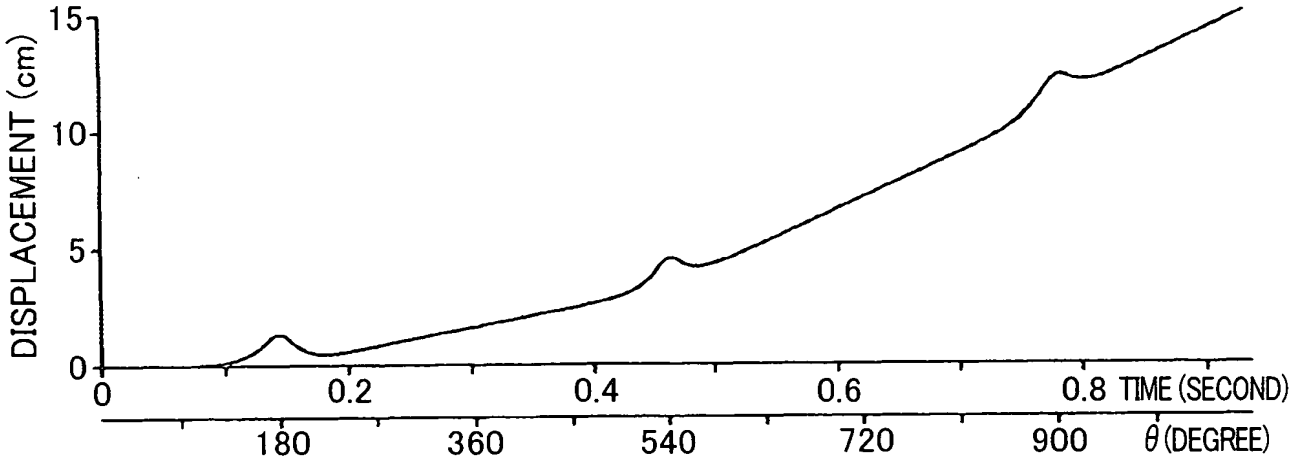

FIG. 4B

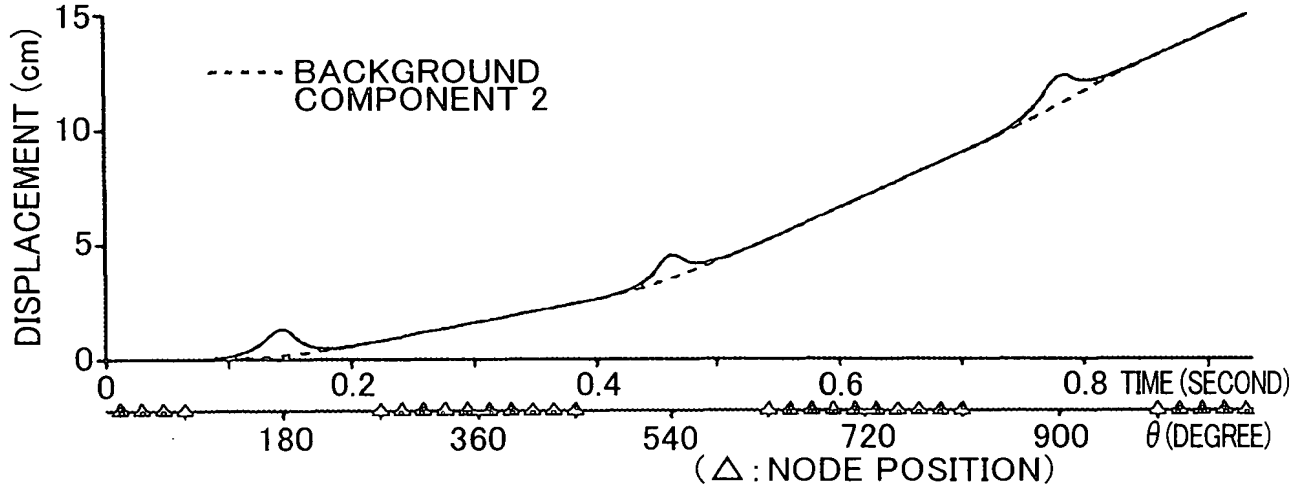

FIG. 4C

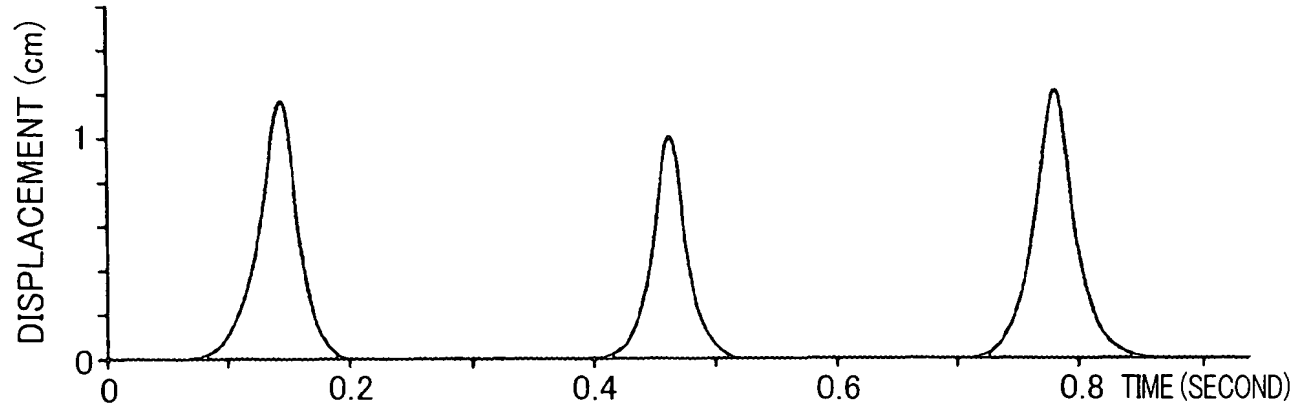

FIG. 5A

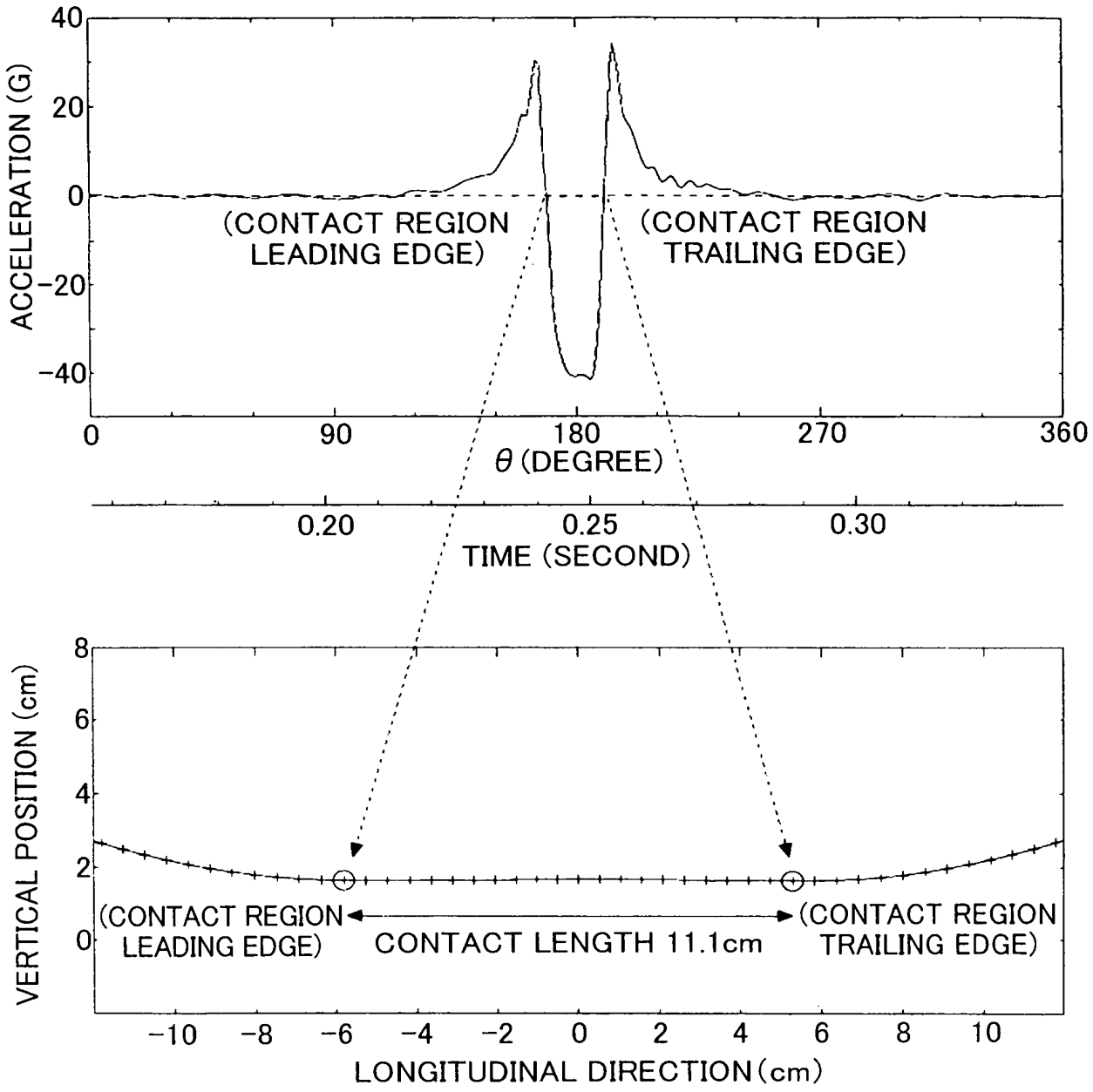
ACCELERATION (G)
40
20
0
-20
-40
(CONTACT REGION LEADING EDGE)
(CONTACT REGION TRAILING EDGE)
0
90
180
270
360
θ (DEGREE)
0.20
0.25
0.30
TIME (SECOND)
VERTICAL POSITION (cm)
8
6
4
2
0
(CONTACT REGION LEADING EDGE)
CONTACT LENGTH 11.1cm
(CONTACT REGION TRAILING EDGE)
-10
-8
-6
-4
-2
0
2
4
6
8
10
LONGITUDINAL DIRECTION (cm)

FIG. 5B

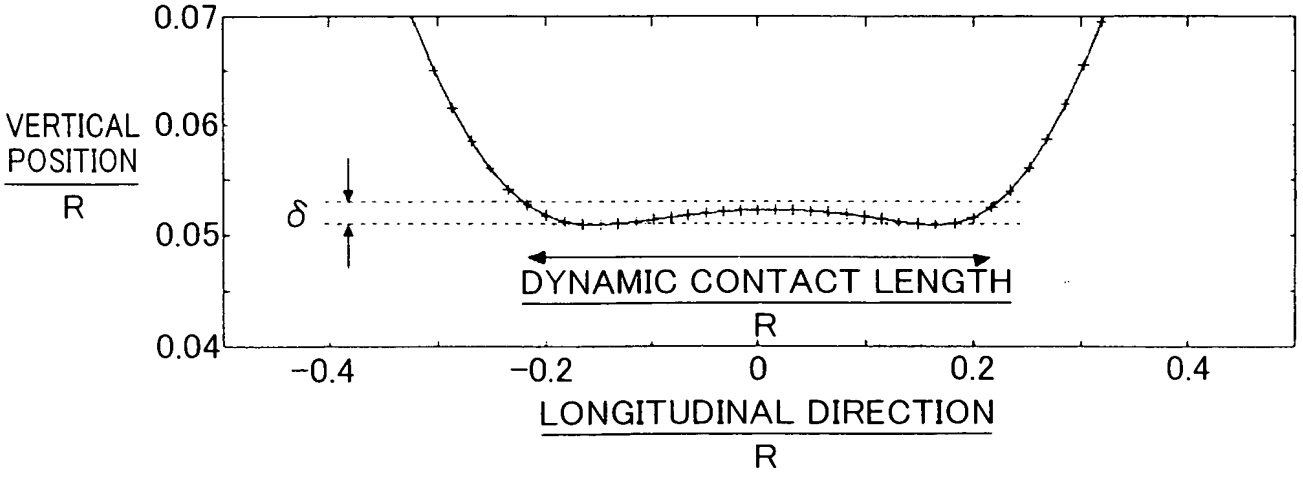
VERTICAL POSITION / R
0.07
0.06
0.05
0.04
δ
DYNAMIC CONTACT LENGTH / R
-0.4
-0.2
0
0.2
0.4
LONGITUDINAL DIRECTION / R

FIG. 6

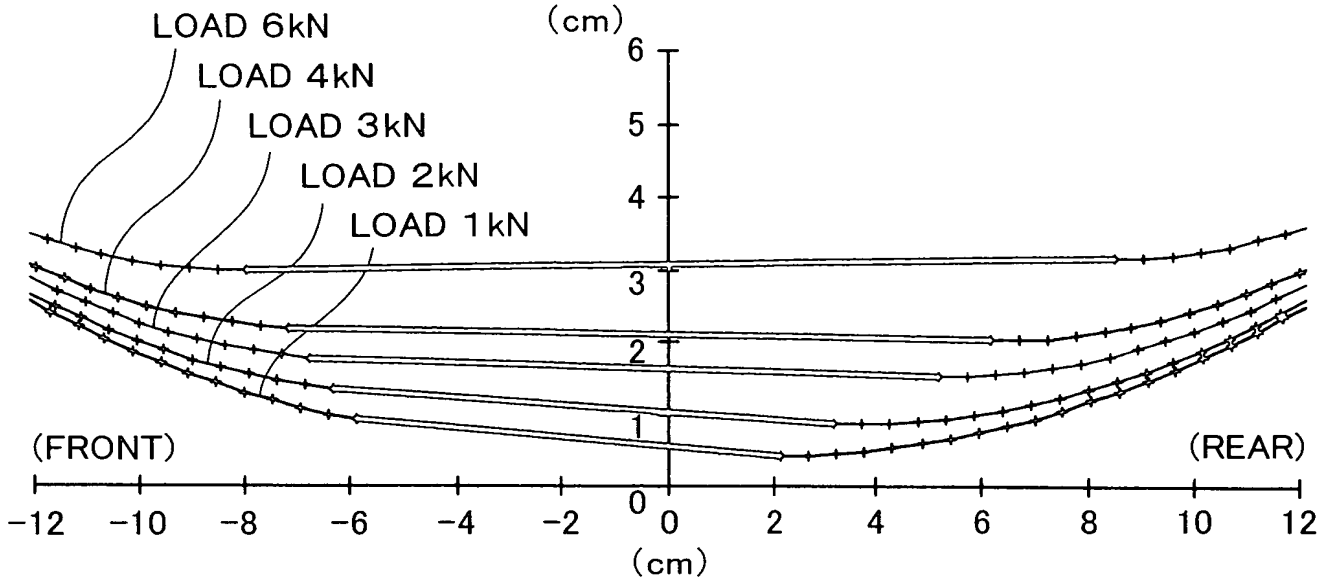
LOAD 6kN
LOAD 4kN
LOAD 3kN
LOAD 2kN
LOAD 1kN
(cm)
6
5
4
3
2
1
0
(FRONT)
(REAR)
−12 −10 −8 −6 −4 −2 0 2 4 6 8 10 12
(cm)

FIG. 7A

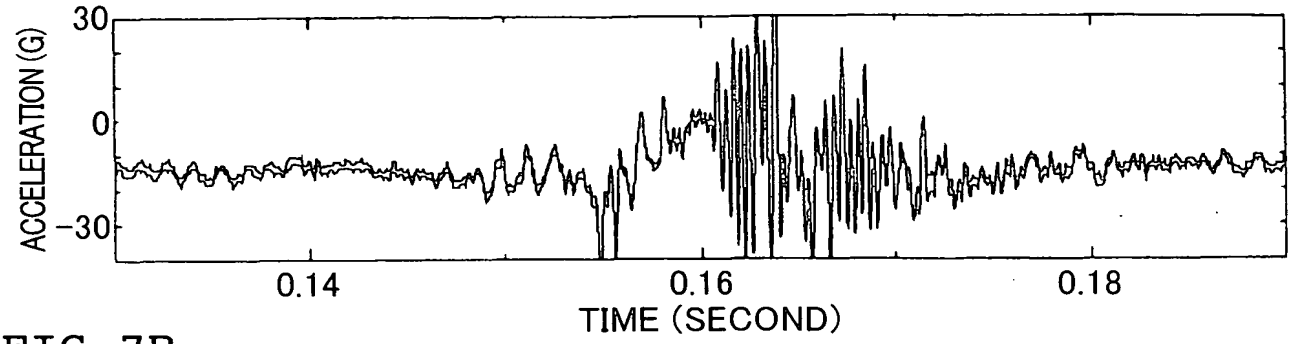

FIG. 7B

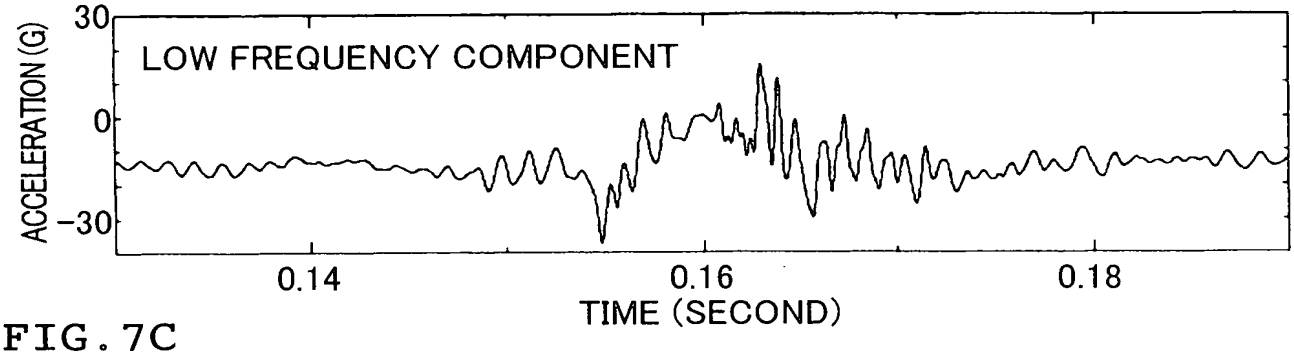

FIG. 7C

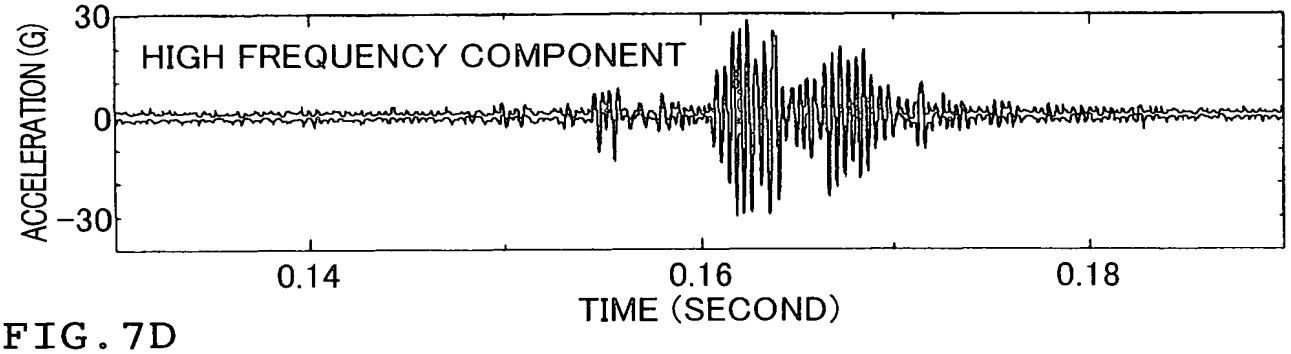

FIG. 7D

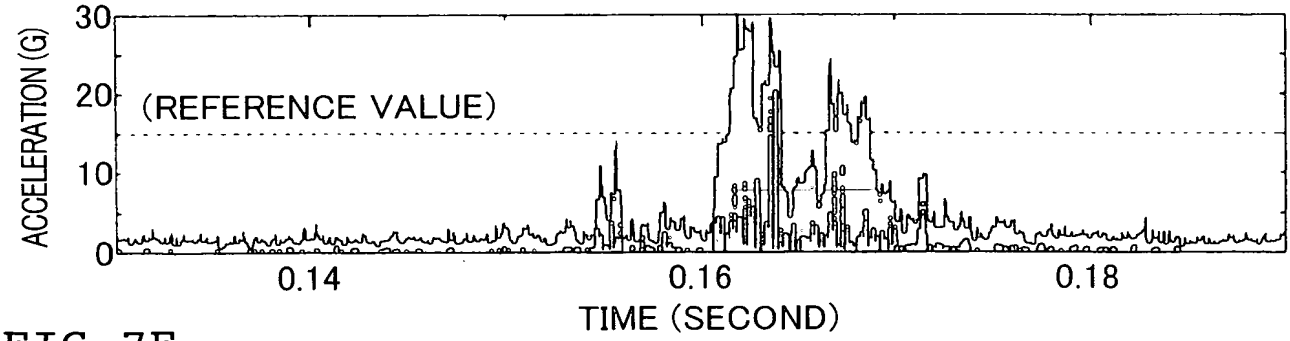

FIG. 7E

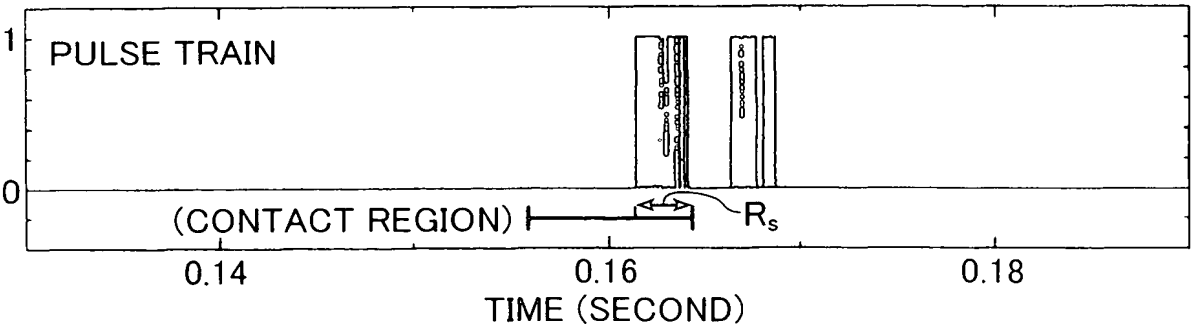

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FIG. 8A

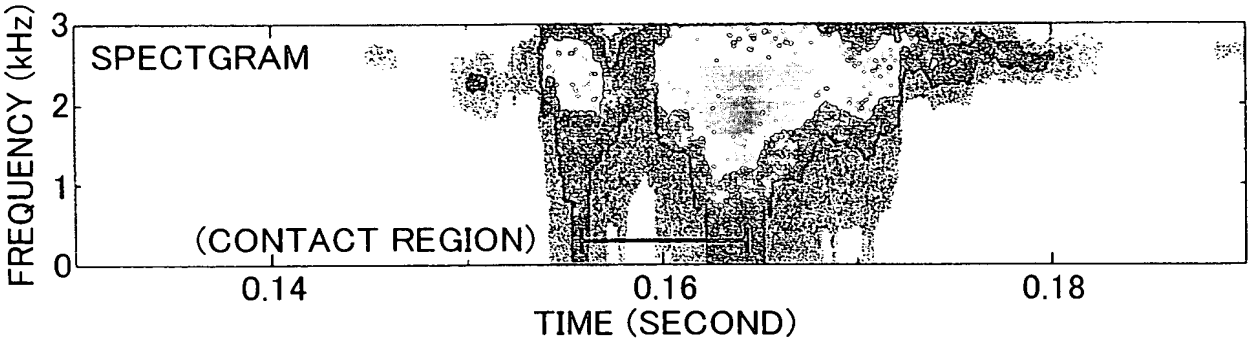
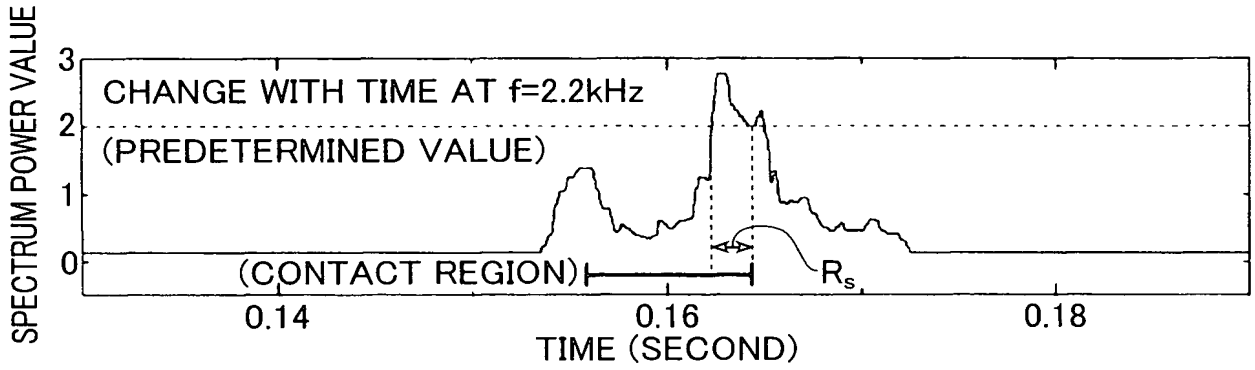
FIG. 8B